

REMARKS

Favorable reconsideration and allowance of the claims of the present application are respectfully requested.

Applicants have amended Claims in a manner as indicated in the above. In particular, support for Claims 1, 18 and 19 can be found at page 7, lines 1-24 of the present application, and the paragraph bridging pages 12 and 13, i.e., Page 12, line 26 to Page 13, line 2 of the instant specification. Furthermore, applicants have amended Claim 1 by replacing the term "more than 65 weight %" with "65 to 85 weight %". The support is also found in the above-identified pages. Moreover, applicants have amended Claim 14 by replacing the term "80°C or more" with "80°C".

Since the above amendments to the claims do not introduce any new matter into the application, entry thereof is respectfully requested.

It is also to be noted that applicants have deleted Claims 20 and 21 without prejudice. Therefore, applicants have not abandoned the deleted subject matter and reserve the right to file a continuation application directed thereto.

The Office Action has rejected that Claims 1 and 5-21 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite in view of the terms recited therein, i.e., "more than 65 weight %", "at least 65%", "at least 75%", "over 85 weight %", "90 to 96 weight % or more", and "80°C or more". Specifically, the Office Action avers that these terms render the claims indefinite since the claimed ranges lack upper or lower limits.

With respect to terms "at least 65%", "at least 75%" and "over 85 weight %" recited in Claim 1, applicants submit that the aforesaid terms are not indefinite because the metes and bounds of the subject matter recited thereof are clear to one of ordinary skill in the art. It is

apparent that these numbers constitute a minimal level of achievement for separation. One of ordinary skill in the art understands the term to represent that at least a certain amount of trimers has been removed from the feed solution, that a minimal amount of saccharide monomers has been removed from the feed, or that there is a minimal amount of yield, respectively, depending on the context. The issue of §112 is whether one skilled in the art understands the metes and bounds of the claims. One of ordinary skill in the art understands a minimum amount of removal from feed or yield, and he understands how to calculate the same and that anything above those amounts would constitute an infringement. Moreover, applicants' remarks in the above are also supported by case law where it has been held that "at least" is not indefinite. See In re Fisher, 427 F.2d 833, 838, 166 U.S.P.Q. 18, 23 (CCPA 1970).

In view of the above remarks and amendments, applicants submit that the instant §112, second paragraph rejection is obviated, and thus reconsideration and withdrawal of such rejection is respectfully requested.

In the Final Rejection, the Examiner further alleges that Claims 18 and 19 are rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. Specifically, the Examiner avers that the terms "monomer and/or saccharide trimer content of 1.5-10 wt% and 1.5-3 wt% on dry solid basis", recited in Claims 18 and 19, respectively are both unsupported in the originally filed specification.

In response, applicants have amended Claims 18 and 19 in a manner as indicated in the above by indicating that the monomer and/or trimer content is less than 1.5% and 3%, respectively. Support is found on Page 7, lines 16-24 of the instant specification. Since the amendments to Claims 18 and 19 obviate the §112, first paragraph rejection, reconsideration and withdrawal of the instant rejection is respectfully requested.

In the Final Rejection, the Examiner further alleges that Claims 1 and 5-21 are rejected under 35 U.S.C. §103(a) as obvious over US Patent No. 6,572,775 to Heikkila et. al. (hereinafter '775 patent) in view of US Patent No. 5,391,299 to Masuda et. al. (hereinafter '299 patent).

In response, applicants submit that the claims of the present application are not rendered obvious by the disclosures of the '775 patent in view of the '229 patent, since the cited two references, either alone or in combination, do not teach, disclose or suggest applicants claimed process.

With respect to the '775 patent, the primary reference, applicants submit that there are several differences between the methodology in the '775 patent and that of the present invention. For example, the '775 patent teaches a separation process wherein the feed solution contains 57.6% of sucrose (a disaccharide), (See Column 8, Table 1B); it does not teach, disclose or suggest a separation process claimed in the present invention wherein the feed solution contains 65 to 85 % saccharide dimer. Moreover, the '775 patent discloses that the resin used in the separation process has a degree of crosslinking of 5.5%, see Column 8, Table 1C; it does not teach, disclose or suggest the use of two different resins for the separation or a resin having a high degree of crosslinking of 5-8% for removal of the saccharide monomers from saccharide dimers and a resin having a low degree of crosslinking of 2-4.5% for removal of saccharide trimers from saccharide dimers, which is in accordance with the presently claimed invention. Furthermore, the '775 patent teaches only the sucrose purity (90.1%) of the separated disaccharide fraction, see Column 8, lines 31-33. It is stressed that the above-mentioned purity figure allows this disaccharide fraction to contain all the trisaccharides and monosaccharides (totaling 3.4%) contained in the original feed solution. The '775 patent does not teach, disclose

or suggest a process resulting in a separated saccharide dimer fraction by removal of at least 75% of the saccharide trimers from the feed solution and/or by removal of at least 65% of the saccharide monomers from the feed solution, and resulting in a purity of saccharide dimer of 90 to 96 weight %, and a yield of same of over 85 weight % on dry solids basis, which is in accordance with the presently claimed invention. Thus, the present separation process is not obvious to one of ordinary skill in the art from the teaching of the '775 patent.

Moreover, applicants would like to draw the Examiner's attention that the effectiveness of a chromatographic separation is dependent upon several factors, including, for example, the constituents in the feed and the amount of the constituents in the feed and the type of column used. If the feed constituents are different in the prior art than in the present invention, one may be unable to utilize the same methodology as in the prior art to effect the separation. There is no way of predicting that the type of columns and conditions used in the prior could also be used to separate the saccharide monomer from dimer and/or saccharide trimer from saccharide dimers, as in the present invention. The type of methodology utilized is dependent upon each set of circumstances and cannot be generalized. It is to be noted that the feeds in the primary and the secondary references are different from those used in the present invention. Therefore, the teachings therein cannot teach, disclose or suggest the present conditions for the separation.

Furthermore, applicants would like to stress that the '775 patent separates molasses into three fractions, namely sucrose, betaine and residual fractions, the latter being largely made up of salts. In contrast, the present invention is concerned with a rather specific separation process, namely the chromatographic separation of sugar-containing feed solution having a high disaccharide content and a relatively low content of saccharide monomers and/or

trimers, in order to obtain a separated disaccharide fraction having a much lower content of undesired saccharide monomers and/or trimers. The present invention is based on the surprising finding that such separation is particularly successful when an ion exchange resin having a high degree of crosslinking (5-8%) is used for removal of the monomers, while an ion exchange resin having a low degree of crosslinking (2-4.5%) is used for remove any saccharide trimers contained in the mixture. The present invention thus provides for particularly efficient removal of monosaccharides and trisaccharides from a feed mixture to allow purification of a feed solution which primarily contain disaccharides. The selection of resin with high degree of crosslinking to remove monosaccharide and low degree of crosslinking to remove trisaccharide to produce a disaccharide fraction with high yield and high purity from a feed solution containing a relatively high amount of a disaccharide and relatively low amounts of a monosaccharide and/or trisaccharide is not taught, disclosed or suggested by the '775 patent.

In view of the above remarks, applicants submit that it is not obvious for a person skilled in the art to select a resin with a high degree of crosslinking and a resin with low degree of crosslinking, and apply them, respectively, in the separation of monosaccharides and trisaccharides from a feed solution having a high disaccharide content and a relatively low content of saccharide monomers and/or trimers to obtain a separated disaccharide fraction having a much lower content of undesired saccharide monomers and/or trimers.

With respect to the secondary reference, the '299 patent teaches a process for production of starch sugars wherein a chromatographic separation step is used to fractionate the mixture into at least three fractions, i.e., glucose, maltose and oligosaccharide. Applicants submit that there would be no reason for a person skilled in the art to combine the primary and secondary references in the first instance since the cited references have different applications,

e.g., have different feed solutions. For example, the primary reference is directed to the separation of molasses into three fractions, namely sucrose, betaine and residual fractions, whereas the secondary reference relates to a process for production of starch sugars. Moreover, even when combined, the secondary reference together with the primary reference do not overcome the deficiencies of the primary reference. For example, the '299 patent does not teach, disclose or suggest a selection of a resin with high degree of crosslinking to remove monosaccharide and low degree of crosslinking to remove trisaccharide to produce a disaccharide fraction with high yield and high purity. Moreover, the '299 patent does not teach, disclose or suggest how to obtain a saccharide dimer product fraction simultaneously with high purity (90-96 wt. %) and in high yields (over 85 wt. %). While the '299 patent may suggest that the glucose and maltose fractions may be subjected to further crystallization or chromatographic fractionation, it fails to teach, disclose or suggest how to maintain the saccharide dimer yield at a level of over 85 wt. %. As such, the secondary reference does not overcome the deficiencies of the primary reference.

Further, the combination fails to disclose or suggest the present invention for another reason. Since the '299 patent does not teach, disclose or suggest a selection of resin having a high degree of crosslinking to remove monosaccharides from saccharide dimers and low degree of crosslinking to remove trisaccharides from saccharide dimers to produce a disaccharide of high purity and high yield, and since for the reasons given hereinabove, the primary reference does not have any such teaching, the combination cannot suggest the use of an ion exchange resin with a degree of crosslinking of 2 to 4.5% to separate saccharide dimers from dimers and the degree of crosslinking of 5 to 8% to separate saccharide monomers from saccharide dimers while providing a dimer fraction containing 90-96 weight % of disaccharide,

as claimed and a yield of over 85% , as claimed. Therefore, applicants submit that the present invention is not obvious over the '775 patent in view of the '299 patent.

Thus, in view of the foregoing amendments and remarks, it is firmly believed that the present case is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,

A handwritten signature in cursive script that reads "Mark J. Cohen". The signature is written in dark ink and is positioned above the printed name.

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